FRED Reports

A SYNOPSIS OF
SOUTHEASTERN ALASKA FRED DIVISION
TAGGING OPERATIONS FOR 1981

by
Johnny Holland

Number 16

Alaska Department of Fish & Game
Division of Fisheries Rehabilitation,
Enhancement and Development

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Abstract

Coded wire tagging (CWT) of salmonids is a standard technique utilized in evaluating production and research in Southeastern Alaska FRED Division hatcheries and projects. Because of the large number of codes used (48 in 1981) and the extended period (one to five years) before each tagging project is completed, a synopsis of each year's tagging program is necessary to ensure optimal utilization of the information provided by the tagging effort.

In this report, I have reviewed the tagging program implemented in 1981, giving all pertinent data for each tagged group of fish, the reasons for tagging, anticipated numbers of tags returning, dates of anticipated returns, and in general, the quality of the data expected. Specialized research projects are reviewed in the appendices.

KEY WORDS: Coded wire tagging, Evaluation, FRED Hatchery

INTRODUCTION

Marking salmonids for various scientific and operational purposes is a major effort in the burgeoning salmon culture of Alaska and other northern Pacific states. In Southeastern Alaska, Division of Fisheries Rehabilitation, Enhancement and Development (F.R.E.D.) personnel marked salmon solely with adipose fin removal and coded wire tags (CWT) in 1981. Approximately 486,600 salmon with valid tags were released from FRED hatcheries and projects this year. The basic purpose for most tagging operations at FRED hatcheries was evaluation of the hatchery production. The term evaluation will be used throughout this document to mean assessing the number of adult salmon produced by the hatchery or project and their impact on various fisheries. Although evaluation was our primary purpose, we did try, where possible, to design tagging schemes so that additional information might be forthcoming. Tagging all (within tag retention limits) chinook salmon, Oncorhynchus tshawytscha, where possible, was a quasi-official policy in Southeast Alaska in 1981.

Salmon were tagged at five of the six state hatcheries in S.E. Alaska in 1981. Because of operational constraints, no fish were tagged at Beaver Falls Hatchery in Ketchikan. Several projects - lake fertilization, a diet study, and evaluation of a wild stock of coho salmon in Speel Lake resulted in the release of salmonids tagged by FRED personnel in 1981. A summary of all tagging efforts is given in Appendix J.

DISCUSSION

HIDDEN FALLS HATCHERY

Hidden Falls Hatchery released only chum salmon, Oncorhynchus keta, in 1981. Tagging was primarily for hatchery evaluation. A secondary investigation of release timing was designed utilizing tagged lots of fry released in April and May. The rearing and release scheme was complex--both fresh and salt water rearing were used and facilities for both were limited. The primary stock incubated was from Kadashan River (KN) with a number of lots delineated by eggtake timing. As Hidden Falls Hatchery has limited fresh water rearing, some fish were reared totally in fresh water, others part time in fresh water and then placed in saltwater pens. The length of saltwater rearing time varied. With the 60,000 tags available (operationally) to us, we chose to make the broad assumption that the tagged fish would generally be representative of the hatchery production--even though we know this is not absolutely so. Operational difficulties prevented marking "representative" fractions of the many lots and sublots reared under varying conditions. With this broad assumption covering the primary goal of tagging-evaluation of hatchery production, we made the secondary thrust of our tagging the assessment of release timing at Hidden Falls Hatchery.

We opted to use only fish from lot KN-1 (an early Kadashan River egg take) and fish that were reared primarily in salt water. Tagged groups included:

A. Tag Code 4-4-6 was placed in 29,947 chum salmon fry. Tagging began 31 March and continued through 3 April 1981. These fish were released 15 April 1981. Size at release was 1.61 g. The number of fish released on 15 April 1981 was 621,000. The tagged fish were representative of the untagged in this release.

B. Tag Code 4-4-5 was placed in 30,156 chum salmon fry. Tagging of this group began on 4 April and continued through 6 April 1981. These fish were released on 15 May 1981. Size at release was 2.43 g. The tagged fish were returned to a saltwater rearing pen containing KN-2 fish and the untagged fish (KN-1) that this tagged group were supposed to represent were released on 8 May 1981. Thus, this tagged group is representative only of itself as far as the secondary tagging goal. The comparison to be made-that of mid-April release with mid-May release is still valid but the ability to extrapolate from tags returned from 15 May release to production of any lot is lost.

By marking 30,000 fish in each lot, we are confident that we can detect a true difference in survival of less than one percentage point, 80% of the time. By waiting for all age classes to return, we need only accept a 5%, or less, chance of concluding there is a difference, if in fact the two lots have the same survival rate.

Summarizing, Hidden Falls Hatchery marking for 1981: 9,013,938 chum salmon were released in April and May. We marked 60,103 for the general purpose of evaluating hatchery production with the understanding that the marked fish were not as representative of the total production as we would have liked. The second purpose of marking was evaluating release timing which should give good information at the established levels of precision. See Appendix A.

SNETTISHAM HATCHERY

Coho, (O. kisutch), chinook, and chum salmon were tagged and released at Snettisham Hatchery in 1981. The goal of the tagging was the evaluation of the hatchery. The hatchery building was under construction in 1981. Incubation was still within the on-site power plant, with out-door rearing in Swedish ponds and silos. Evaluation of releases from the facility under these conditions in no way should be interpreted as indicative of cultural conditions of the completed hatchery. There were no secondary goals of any tagging at Snettisham during 1981.

A. Tag Code 4-20-49 was placed in essentially all (23,569 of 26,746) chinook salmon released. Tagging chinook salmon began 3 March and ended 6 March 1981. The fish were released 29 May 1981 at 12 g. King Salmon River, 1979 B.Y. stock was used.

B. Tag Code 4-4-4 was placed in 45,602 chum salmon tagged at Snettisham in 1981. More than two million (2,043,258) chum salmon were released this year. Tagging began on 27 April and continued through 1 May 1981. Chum salmon were released 8 May 1981 at 1.09 g. The tagged salmon were representative of the total release. A tag retention evaluation was done at the time of tagging to discern the temporal pattern of tag loss in the 2 weeks following tagging. One thousand and sixteen tagged fish were utilized in this study and disposed of. No tags were lost from the study group so temporal variation in tag loss could not be discerned. Chum salmon returns in 1980 and 1981 (about 150 and 1,000 respectively) have not included any tagged fish groups. Numbers returning have been roughly those anticipated, though somewhat less than anticipated for 1981. Commercial Fisheries Division personnel have noted an unprecedented increase in the net fishery around Snettisham Arm during these years. We are anticipating being able to confirm a contribution to this fishery with 1981 tagged releases.

C. Coho salmon were tagged with three different codes at Snettisham in 1981. Code 4-19-7 was placed in 2,356 fish, 4-19-18 in 7,795 fish, and 4-19-19 in 7,990 fish for a total of 18,141 tagged coho salmon released at Snettisham. There were no differences among the tagged lots, so the sum of the lots should be used in expanding numbers of returned tags for hatchery evaluation with 4-19-18 accounting for 43% of the tagged fish, 4-19-19 for 44%, and 4-19-7 for 13%. Coho salmon tagging began on 6 March and continued through 9 March 1981. At tagging the average fish was 3.5 g but a large amount of variability was noted. All coho salmon were released on 29 May 1981 at 5.5 g. Tag retention after 81 days was 76.8%. We should note that the above number of tagged fish released (18,141) has been corrected for tag loss at the time of release.

In summary, three species of salmon were released from Snettisham Hatchery in 1981. Each species released included a representative group of tagged fish. The tagging goal was to evaluate hatchery production.

CRYSTAL LAKE HATCHERY

Three salmon species were released from Crystal Lake Hatchery in 1981. Hatchery operations included isolation of chinook and coho eggs. Design and operation of the isolation facility resulted in higher than anticipated mortality.

Again all the chinook salmon to be released were tagged--39,117 validly tagged fish of 42,197 chinook salmon smolts released. Three different tag groups of chinook salmon were released from Crystal Lake Hatchery in 1981.

A. Tag Code 4-20-43 was placed in 18,682 chinook salmon. Tagging occurred between 1-7 April 1981 with release into Crystal Creek on May 15. Size at release was 38 g.

B. Tag Code 4-20-42 was placed in 18,530 chinook salmon. Tagging occurred between 7-12 April with release on May 15 into Crystal Creek. Size at release was 38 g.

C. Tag Code 4-20-45 was placed in 1,905 chinook salmon. Tagging occurred between 13-17 April 1981 with release into Crystal Creek on May 15. Size at release was 38 g.

There were no experimental differences between tagged groups and the goal of tagging was production evaluation. Notations concerning difficulties in tagging were found in tagging summary forms. All three release groups were Andrew Creek stock, 1979 brood.

Coho salmon released from Crystal Lake Hatchery in 1981 were of two broodstocks, Duncan Salt Chuck and Crystal Creek - all were 1979 brood. Of 569,017 coho salmon released, 81,098 were tagged. Four different tag groups of Crystal Creek stock were released - Duncan Salt Chuck smolts (22,211) were released with no tagged group. As tagged adults returning to the hatchery will be selected for brood stock, the Duncan Salt Chuck stock will be eliminated from the hatchery in time. One of the four tag groups was released into Ohmer Creek. Three different tag codes were used in tagging coho salmon released into Crystal Creek from Crystal Lake Hatchery in 1981. Coho tag groups were:

A. Tag Code 4-20-44 was placed in 20,355 coho salmon released into Ohmer Creek. This tagged group was representative of 69,895 fish released. Tagging occurred 17-21 April 1981 with release on 1 June. Size at release was 16.3 g. This release was designed to assess the feasibility of initiating a return run more accessible to fishermen than that supported by coho salmon returning to Crystal Creek.

B. Tag Code 4-19-22 was placed in 9,902 coho salmon released into Crystal Creek. This tagged group was representative of 77,737 fish released. Tagging occurred 10-15 April 1981 with release on 26-27 May. Size at release was 15.6 g.

C. Tag Code 4-20-51 was placed in 25,722 coho salmon released into Crystal Creek. This tagged group was representative of 201,763 fish released. Tagging occurred 13-16 April 1981 with release on 26-27 May. Size at release was 15.6 g.

D. Tag Code 4-20-52 was placed in 25,119 coho salmon released into Crystal Creek. This tagged group was representative of 197,411 fish released. Tagging occurred 8-12 April 1981 with release on 26-27 May. Size at release was 15.6 g. The fish released into Crystal Creek averaged 15.6 g while those released at Ohmer Creek were around 16.3 g each. Numbers of tags should be sufficient to allow analysis of differences in survival between release sites.

Tag Code 4-4-3 was placed in 11,575 chum salmon released from Crystal Lake Hatchery into Crystal Creek on 1 May 1981. Tagging was between 21 and 24 April 1981. Chum salmon were released at 1.4 g. All 12,802 chum salmon released had been through the tagging procedure. The goal of tagging was hatchery evaluation.

In summary, Crystal Lake Hatchery released 131,790 validly tagged fish in 1981. Chinook, coho and chum salmon were released. The basic goal of tagging was hatchery evaluation but we should be able to analyze coho salmon released at Ohmer and Crystal Creeks for variations in returns if sufficient tag recovery efforts are made. See Appendix B.

KLAWOCK HATCHERY

Chum and coho salmon and steelhead trout, Salmo gairdneri, were tagged and released at Klawock Hatchery in 1981. The primary purpose of this year's tagging program was hatchery evaluation. Secondary goals included testing the hypothesis that extended rearing does not increase survival to adults in chum salmon reared at Klawock Hatchery. See Appendix C.

Tagged chum salmon groups include:

A. Tag Code 4-3-6 was placed in 6,676 chum salmon fry. Those fish were tagged 8-10 April 1981 and released during the period from 13 April 1981 to 26 May 1981. Weight at release ranged from 1.2 g to 4.1 g with a weighted mean of 2.1 g at release. This tagged group is representative of 818,810 fish released during this period. This group (code) is to be utilized, along with 4-3-5 and 4-5-1, in the evaluation of the normal hatchery production. They will be compared with groups of extended rearing fish (4-19-13, 4-19-23, 4-19-24).

B. Tag Code 4-5-1 was placed in 8,508 chum salmon fry. These fish were tagged on 5-12 May and released on 17-22-28 May 1981. They are representative of 672,895 fish released over that period. Tagging goals are as stated in A above. Tag codes 4-5-1 and 4-3-6 are analogous groups of fish. All were to be tagged with 4-3-6 code but the tagging machine destroyed the majority of the wire which was replaced by wire coded 4-5-1.

C. Tag Code 4-3-5 was placed in 15,438 chum salmon fry. These fish were tagged between 29 April and 5 May and released between 13 April and 26 May 1981. Size at release ranged from 1.0 to 4.1 g with a weighted average of 2.43 g. This release group is representative of 1,752,820 fish released during this period.

D. Tag Code 4-19-13 was placed in 9,122 chum salmon fry. These fish were tagged on 18-19 May and released on 26 May 1981. Mean size at release was 6.5 g. Tagged released fish are representative of 50,430 fish released on this date. This group of fish, along with those of tag codes 4-19-23 and 4-19-24 were reared differently than the standard hatchery production lots (previous tag codes) in that they were started at low densities in rearing ponds and reared without recurring releases and/or redistribution as were the standard production lots at this facility. Comparisons of survival of these code groups with standard production lots will be made.

E. Tag Code 4-19-23 was validly placed in 8,944 chum salmon fry. These fish were tagged on 18-19 May and released on 26 May 1981. Mean weight at release was 6.6 g. Tagged released fish are representative of 60,447 fish released on this date. Purpose at tagging as D above.

F. Tag Code 4-19-24 was placed in 1,591 chum salmon fry. These fish were tagged on 21 May and released on 26 May 1981. Mean weight at release was 6.5 g. Tagged released fish are representative of 9,054 fish released. Purpose of tagging as D above.

The coho salmon tagging program at Klawock consisted of releasing two groups tagged in 1980 and tagging two other groups for release in 1982. Of 36,537 coho salmon released from Klawock in 1981, 35,563 carried CWT. See Appendix D.

A. Tag Code 4-19-41 was implanted in 17,069 coho fingerlings. They were tagged 18-25 November 1980 and released 26-27 March 1981 into the east end of Klawock Lake. Size at release was 19 g, 119 mm. Eighteen-thousand and forty-three (18,043) fish were released. Primary purpose of this tagging was to evaluate lake release of coho pre-smolts.

B. Tag Code 4-19-42 was implanted in 18,494 coho fingerlings. They were tagged 8-15 December 1980 and released 28 May 1981 from Klawock Hatchery. Size at release was 25 g. All fish released were tagged. Primary purpose for tagging was hatchery evaluation to compare with lake release group from A above.

C. Tag Code 4-20-53 was implanted in 38,153 of 44,213 coho pre-smolts released into Klawock Lake. Tagging occurred 9-17 December 1981 for release 4-10 February 1982. Size at release was 25 g, 135 mm. Purpose of this tagging was evaluation of lake release of coho pre-smolts.

D. Tag Code 4-21-59 was implanted in 18,960 of 21,950 coho smolts released from Klawock Hatchery 26 May 1982. Tagging occurred between 28 December 1981 and 3 February 1982. Size of fish at release was 27 g, 136 mm. Fish released totaled 21,950. Purpose for tagging was hatchery evaluation and comparison with lake-released fish 4-20-53 (C above).

Steelhead trout tagged and released at Klawock in 1981 involved one group tagged in 1980 and released in 1981.

A. Tag Code 4-19-12 was implanted in steelhead trout from Klawock River 1980 brood year (5,886 valid tags). Six-thousand four-hundred and twenty-two (6,422) fish were released at the hatchery on 17 June 1981 after being tagged 17-24 December 1980. Size at release was 42.4 g, 175 mm. Purpose of tagging was hatchery evaluation.

In summary, Klawock hatchery released 91,728 validly tagged fish in 1981. In addition to hatchery evaluation, tagging in 1981 was designed to provide information pertinent to hatchery operational procedures for both chum and coho salmon. See Appendices C and D.

DEER MOUNTAIN HATCHERY

At Deer Mountain Hatchery, two species of salmon and steelhead trout were tagged and released in 1981. Again, the primary goal of tagging was hatchery evaluation, but several experimental lots were tagged with the secondary purpose of testing hypotheses concerning hatchery practices.

For probably the last time, all chinook salmon released from Deer Mountain Hatchery in 1981 were tagged. Six different tag codes were implanted in as many groups of chinook salmon. Five lots were released in 1981 with the sixth (4-19-44) held for release in 1982. This latter lot was originally to be released in 1981 as zero-check smolts but failed to gain proper size for smoltification. The other five lots of chinook salmon were treated to determine the effect of size at release on survival to adult. Size ranged from 29.6 g to 13.4 g for various lots. Numbers of fish tagged were sufficient that given favorable numbers of returns, analysis should provide statistically valid results. See Appendices E and F. The tag lots were as follows:

A. Tag Code 4-19-17 was implanted in a group (3,821) of Cripple Creek 1979 brood year chinook pre-smolts. These fish were a portion of the designated "large" group and had been reared inside the hatchery. They were tagged on 2 February 1981 and were released into Ketchikan Creek on 15 May 1981. This group is a part of the overall hatchery evaluations and also may be utilized in size-at-release analysis.

B. Tag Code 4-19-43 was implanted in a group (14,364 valid tags) of Cripple Creek 1979 brood year chinook pre-smolts. These fish were a portion of the "large" size group. They were reared outside the building. They were tagged 13-16 January 1981 and released 15 May at 25.6 g. They are part of the overall hatchery, evaluation and again may be utilized in size-at-release analysis. Not part of the original design but of potential interest is that this group and the following (4-19-45) were held outside the hatchery while the preceeding group (4-19-17) was reared inside. The small numbers of fish per group may preclude rigorous analysis of inside-vs-outside rearing.

C. Tag Code 4-19-45 was implanted in a group (14,533) of Cripple Creek 1979 brood year chinook pre-smolts. These fish were a portion of a "medium" size group reared outside the hatchery. They were tagged 20-22 January 1981 and released on 15 May 1981 at 18 g, 114 mm. They are part of the overall hatchery evaluation and again may be utilized in size-at-release analysis.

D. Tag Code 4-20-39 was implanted in a group (15,204) of Cripple Creek 1979 brood year chinook pre-smolts. These fish were designated as medium size. These fish were also reared outside. They were tagged on 23-27 January 1981 and released 15 May at 16.8 g. They are part of the overall hatchery evaluation and attempt to assess size-at-release effect on survival.

E. Tag Code 4-20-40 was implanted in a group (15,734) of Cripple Creek 1979 brood year chinook pre-smolts. These fish were designated "small." They were reared outside and tagged 28-30 January 1981. They were released on 15 May 1981 at 13.4 g. They are part of the hatchery evaluation and the attempt to correlate size of release to survival.

F. Tag Code 4-19-44 was implanted in a group (19,886) of Cripple Creek 1980 brood year chinook fry. These fish were to be released as zero check smolts (pending smoltification analysis) on or by 15 June, 1981. This group of fish was not released as scheduled (released in 1982) so will not play any part in hatchery evaluation from 1981 releases. This lot was tagged 22-29 April 1981 when the fish were at 2 g. The tagging crews with a great deal of experience tagging large chinook pre-smolts, preferred tagging the smaller fry.

Two lots of coho salmon were tagged at Deer Mountain Hatchery in 1981. Of 67,548 coho salmon released in these lots, 19,152 were tagged. The primary purpose for tagging was to evaluate hatchery coho salmon production. However, we found that the two lots had been reared somewhat differently, either inside the hatchery building or in outside ponds of similar design. Differential tagging may allow us to assess impacts of such practices on adult returns. See Appendix G.

A. Tag Code 4-19-16 was implanted in a group (6,480) of Ketchikan Creek 1979 brood year coho salmon pre-smolts. These fish were reared inside the hatchery building. They were tagged 4-5 February 1981 and released on 1 June into Ketchikan Creek. Size at release was 17.8 g. Tags were for overall hatchery evaluation and to test hypothesis of no difference in adults returning from coho salmon reared inside and outside the hatchery.

B. Tag Code 4-20-41 was implanted in a group (12,672) of Ketchikan Creek 1979 brood year coho salmon pre-smolts. These fish were reared outside the hatchery. They were tagged on 9-11 February 1981 and released on 1 June into Ketchikan Creek. Size at release was 15.9 g. Tagging purpose was the same as 4-19-16 above.

Steelhead trout released from Deer Mountain Hatchery in 1981 were tagged in two lots. Purpose for tagging was evaluation of the Ketchikan Creek steelhead trout rehabilitation project and hatchery evaluation. Vandals had killed the majority of steelhead being reared at hatchery.

A. Tag Code 4-19-15 was implanted in a group (2174) of Ketchikan Creek 1978 brood year steelhead trout. Size estimate on 14 October 1980 for this group was 120 g, 240 mm. Tagging on 7-12 January 1981 proved very difficult because of the large size and large variation in the size of fish. This lot was released on 8 June 1981 into Ward Creek. Release size was 155.5 g. Hatchery evaluation and Ketchikan Creek Rehabilitation Project evaluation was the purpose of tagging.

B. Tag Code 4-19-14 was implanted in a group (1,112) of Ketchikan Creek 1979 brood year steelhead trout. These fish averaged 37 g, 155 mm on 31 December 1980. They were tagged on 7 January 1981 and released on 1 June into Ketchikan Creek. Size at release was 65.4 g. Tagging goals were as above.

In summary, Deer Mountain Hatchery released 109,989 tagged salmonids in 1981. The primary goal of tagging was hatchery evaluation. Chinook salmon were tagged and released in five groups originally designated as different in respect to weight and length. Numbers tagged should allow fairly rigorous statistical machination of return data. Coho salmon (and to a limited degree, chinook salmon) released in 1981 from Deer Mountain Hatchery may produce data allowing comparisons of inside-vs-outside rearing. Steelhead were also tagged before release. Little or no statistical analysis will be forthcoming on the two lots released because of small lot size remaining after vandals turned off water flow at hatchery. There was a substantial size difference at release as the lots represented two brood years, the "large" lot being held over for an extra year because of their small size at the normal release time for their brood. Comparisons may have been possible if lot size had been somewhat larger.

Microwire tagging by FRED Division personnel also occurred outside the production hatcheries. Three projects in Southeast Alaska required tagging of salmon in 1981.

A diet trial conducted at the Auke Creek facility in which seven small lots of chum salmon were reared for 10 weeks on different diets, tagged, and released. Analysis of growth data provided immediate assessment of diet quality. Tagging will provide additional information when tags are recovered. The small release groups will probably preclude rigorous statistical analysis of return data. See Appendix H.

Tag codes used and release data include:

A. Code 4-7-7 placed in chum fry fed Abernathy dry diet. Of 874 fish released, 839 contained valid tags. They were released on 15 May 1981 into Auke Creek. Size at release was 0.91 g.

B. Code 4-7-6 placed in chum fry fed Alaska Moist Pellet - 20% fat. Of 891 fish released, 860 contained valid tags. They were released on 15 May 1981 into Auke Creek. Release size was 1.23 g.

C. Code 4-7-5 placed in chum fry fed Alaska Moist Pellet - 17% fat. Of 893 fish released, 880 contained valid tags. They were released on 15 May 1981 into Auke Creek. Release size was 1.20 g.

D. Code 4-7-4 placed in chum fry fed Alaska Moist Pellet - 14% fat. Of 884 fish released, 875 contained valid tags. They were released on 15 May 1981 into Auke Creek. Release size was 1.21 g.

E. Code 4B-8-5 placed in chum fry fed BioDiet. Of 894 fish released, 863 contained valid tags. They were released on 15 May 1981 into Auke Creek. Release size was 1.27 g.

F. Code 4B-8-6 placed in chum fry fed Oregon Moist Pellet. Of 884 fish released, 822 contained valid tags. They were released on 15 May 1981 into Auke Creek. Release size was 1.28 g.

G. Code 4B-8-7 placed in chum fry fed Alaska Dry Pellet. Of 893 fish released, 839 contained valid tags. They were released on 15 May 1981 into Auke Creek. Release size was 1.36 g.

Tagging of Speel Lake coho wild stock was continued in 1981. This project in which Speel Lake wild stock are tagged was in its third year of FRED involvement. More than 12,000 coho salmon were tagged with two codes. The primary purpose was a comparison of survival and fishery contribution between the wild and hatchery propagated stock. Two sizes of coho were tagged differentially from this tagging. We hope to assess their residency time in the freshwater system. See Appendix I

A. Tag Code 4-21-45 placed in coho salmon fingerlings. Of 8,022 fish released, 7910 contained valid tags. They were tagged and released into Speel Lake 8-10 September 1981. This was the smaller of two groups. Average size at tagging was 78.6 mm.

B. Tag Code 4-21-72 placed in coho salmon fingerlings. Of 4,309 fish released, 4,210 contained valid tags. They were tagged and released 8-10 September 1981. Average size at release was 104.6 mm.

The lake fertilization project includes the only tagging of sockeye salmon in S.E. Alaska. The tagging purpose is to evaluate the lake fertilization project.

A. Tag Code 4-20-46 was placed in sockeye salmon released at Hugh Smith Lake. All 10,528 fish released contained valid tags. Tagging occurred 13-19 May 1981 with release during the same period. Size at release was 3.55 g.

B. Tag Code 4-19-25 was placed in sockeye salmon released at Hugh Smith Lake. All 7,621 fish released contained valid tags. Tagging occurred between 27 May and 10 June, 1981 with release during same period. Size at release was 3.55 g.

C. Tag Code 4-20-47 was placed in sockeye salmon released at Hugh Smith Lake. All 10,225 fish released contained valid tags. Tagging occurred 19-27 May 1981 with release during same period. Size at release was 3.55 g.

APPENDIX A

Experimental Tagging - Hidden Falls Hatchery
Chum Salmon

Appendix A - Experimental Tagging

HIDDEN FALLS

1. Release Timing. Chum Salmon

a. Tag Code 4-4-6, 29,947 valid tags released on April 15.
b. Tag Code 4-4-5, 30,156 valid tags released on May 15.

Comparison - operational efficiency of releasing smaller fry (1.61 grams) earlier or larger fry (2.43 grams) a month later. Hypothesis - no difference in adult returns. We will not be able to assess whether a difference in adult returns is due to size at release or release timing, but if a significant difference occurs, it will provide direction for fine tuning hatchery operations.

Expected adult chum salmon produced from Hidden Falls 1981 release[1/].

Year	Age	%	Annual	Fishery[2/]	Rack
1983	0.2	5	9,014	4,507	4,507
1984	0.3	80	144,223	72,111	72,112
1985	0.4	15	27,042	13,521	13,521
Total			180,279		

1/ 2% marine survival
2/ 50% interception

Expected numbers of tagged chum salmon from Hidden Falls 1981 release.

Code	4-4-6 (29,947)			4-4-5 (30,156)		
Year	Total	Fishery	Rack	Total	Fishery	Rack
1983 -	30	3	15	30	3	15
1984 -	479	48	235	483	48	242
1985 -	90	9	45	90	9	45
Total	599			603		

1/ 2% ocean survival
2/ 50% interception
3/ 20% sampling

APPENDIX B

Experimental Tagging - Crystal Lake Hatchery
Coho Salmon

Appendix B - Experimental Tagging

CRYSTAL LAKE HATCHERY

1. Release Site. Coho Salmon

   A. Tag Code 4-20-44, 20,355 valid tags released in Ohmer Creek. Representative of 69,895 fish released. Size at release 16.3 g. Release on 1 June 1981.

   B. Tag Code 4-19-22, 9902 valid tags released into Crystal Creek. Representative of 77,737 fish released. Size of release 15.6 g. Release 26-27 May 1981.

   C. Tag Code 4-20-51, 25,722 valid tags released into Crystal Creek. Representative of 201,763 fish released. Size at release 15.6 g. Release 26-27 May 1981.

   D. Tag Code 4-20-52, 25,119 valid tags released into Crystal Creek. Representative 197,411 fish released. Size of release 15.6 g. Release 26-27 May 1981.

Comparison - To assess relative survival and fishery impact of similar groups of coho salmon released in different areas around Crystal Lake Hatchery.

Expected adult coho produced from Crystal Lake 1981 release[1/]

Year	Total	Fishery[2/]	Rack
1982	11,308	5,654	5,654

1/ 2% Marine Survival
2/ 50% Interception

Expected number of tagged coho salmon from Crystal Lake 1981 release[1/]
Code:

4-20-44(20,355)			4-19-22(9,902)		
Total	Fishery[2/]	Rack	Total	Fishery	Rack
407	41	204	198	20	99

4-20-51(25,722)			4-20-52(25,119)		
Total	Fishery	Rack	Total	Fishery	Rack
514	51	257	502	50	251

1/ 2% Marine Survival
2/ 50% Interception
20% Sampling

APPENDIX C

Experimental Tagging - Klawock Hatchery
Chum Salmon

Appendix C - Experimental Tagging

KLAWOCK HATCHERY

1. Extended Rearing - Chum Salmon
   - A. Tag Code 4-3-6, 7,671 valid tags
   - B. Tag Code 4-5-1, 8,508 valid tags — Group A
   - C. Tag Code 4-3-5, 15,438 valid tags
   - D. Tag Code 4-19-13, 9,122 valid tags
   - E. Tag Code 4-19-23, 8,944 valid tags — Group B
   - F. Tag Code 4-19-24, 1,591 valid tags

Comparison: Operational efficiency of two different rearing schemes. Group A are the normal operational fish at Klawock Hatchery. These fish are started at normal densities and tagged at approximately 1 g. As growth occurs and densities reach accepted maxima, portions of the fish in each tank are released (tagged and untagged). This continues until final release date is reached and all remaining fish are released. Obviously fish from a given tag group are released through time at varying sizes from just over 1 g. to over 4 g.

Group B are the experimental lots of fish which were started at low densities, tagged at 1.0 g. and reared without intermittant releases until a release date is reached. This results in a more uniform release of large fry.

Expected adult chum salmon produced from Klawock 1981 release[1/]

Year	Age	%	Annual	Fishery[2/]	Rack
1983	0.2	(20%)	6,729	5,383	1,346
1984	0.3	(75%)	25,234	20,187	5,047
1984	0.4	(5%)	1,682	1,346	336
Total			33,645		

1/ 1% Marine Survival
2/ 80% Commerical Catch

Expected number of tagged chum salmon (Group A) from Klawock 1981 release[1/]

Code	4-3-6 (6,676)			4-5-1 (8,508)			4-3-5 (15,438)		
	Total	Fishery[2/]	Rack	Total	Fishery	Rack	Total	Fishery	Rack
1983	15	2	3	17	3	3	30	5	6
1984	58	9	12	64	10	13	116	19	23
1985	4	1	1	4	1	1	8	1	2
Total	77	12	16	85	14	17	154	25	31

1/ 1% Marine Survival
2/ 80% Interception
20% Sampling

Expected number of tagged chum salmon (Group B) from Klawock 1981 release[1/]

Code	4-19-13 (9,122)			4-19-23 (8,944)			4-19-24 (1,586)		
	Total	Fishery[2/]	Rack	Total	Fishery	Rack	Total	Fishery	Rack
1983	18	3	4	18	3	4	3	0	1
1984	68	11	14	67	11	13	12	2	2
1985	5	1	1	4	1	1	1	0	0
Total	91	15	19	89	15	18	16	2	3

[1/] 1% marine survival

[2/] 80% interception
20% sampling

APPENDIX D

Experimental Tagging - Klawock Hatchery
Coho Salmon

Appendix D - Experimental Tagging

KLAWOCK HATCHERY

2. Coho Lake Stocking

A. Tag Code 4-19-41, 17,065 valid tags released 26-27 March in Klawock Lake.

B. Tag Code 4-19-42, 18,494 valid tags released 28 May into Klawock River.

Comparison: To investigate survival to adults of coho presmolts put into Klawock Lake in fall/winter and compare to smolts released at the hatchery in the spring. We will not be able to compare a fall/winter lake release to a spring hatchery release because lake ice prevented planting the fish until late March.

Expected adult coho salmon produced from Klawock Hatchery 1981 release[1/]

Year	Total	Fishery[2/]	Rack
1982	1,461	1,169	292

1/ 4% Marine Survival
2/ 80% Interception

Expected number of tagged coho salmon from Klawock Hatchery 1981 release[1/]

	Code 4-19-41 (17,065)			Code 4-19-42 (18,494)		
Year	Total	Fishery[2/]	Rack	Total	Fishery	Rack
1982	683	109	137	740	118	148

1/ 4% Marine Survival
2/ 80% Interception
50% Sampling

Appendix E

Experimental Tagging - Deer Mountain Hatchery
Chinook Salmon

Appendix E - Experimental Tagging

DEER MOUNTAIN HATCHERY

1. Release size. Chinook salmon

   A. 4-19-17, 3,821 valid tags - large
   B. 4-19-43, 14,364 valid tags - large
   C. 4-19-45, 14,533 valid tags - medium
   D. 4-20-39, 15,204 valid tags - medium
   E. 4-20-40, 15,734 valid tags - small

Comparison - Five tagged groups of chinook salmon were released from Deer Mountain Hatchery, with two designated as large (24-29 g.), two as medium (17-18 g.) and one as small (14 g.). The hypothesis to be tested is that there are no differences in number of adults returning from the various groups. Of 65,743 released, 63,656 were tagged.

Expected adults chinook salmon produced from Deer Mountain 1981 release[1/]

Year	Age	%	Annual	Fishery[2/]	Rack
1984	1.3	50	986	789	197
1985	1.4	25	493	394	99
1986	1.5	26	493	394	99
Total			1,972		

1/ 3% Marine Survival
2/ 80% Commercial Catch

Expected numbers of tagged chinook salmon from Deer Mountain 1981 release[1/]

	4-19-17(3821)			4-19-43(14364)			4-19-45(14533)		
	Total	Fishery[2/]	Rack	Total	Fishery	Rack	Total	Fishery	Rack
'84	58	23	12	215	86	43	218	87	44
'85	29	12	6	108	43	22	109	44	22
'86	28	11	6	108	43	22	109	44	22
	115			431			436		

	4-20-39(15204)			4-20-40(15734)		
	Total	Fishery	Rack	Total	Fishery	Rack
'84	228	91	46	236	94	47
'85	114	46	23	118	47	24
'86	114	46	23	118	47	24
	456			472		

1/ 3% Marine Survival
2/ 80% Commercial Harvest
50% Sampling

APPENDIX F

Experimental Tagging - Deer Mountain Hatchery
Chinook Salmon

Appendix F - Experimental Tagging

DEER MOUNTAIN HATCHERY

2. Outside-vs-Inside Rearing-Chinook Salmon

A. 4-19-17, 3,821 valid tags - inside reared.
B. 4-19-43, 14,364 valid tags - outside reared.

Comparison - The two groups of "large" pre-smolts tagged in the release size experiment are essentially similar except that one was reared entirely within the hatchery. The other was reared outside the hatchery. The hypothesis to be tested is that there is no difference in numbers of adults returning. The test is weakened by the small number of tags of one group and by the approximate 5 gram size difference between the two groups.

Expected number of chinook salmon from Deer Mountain 1981 release-inside vs-outside rearing[1/]

	4-19-17 (3,821)			4-19-43 (14,364)		
	Total	Fishery[2/]	Rack	Total	Fishery	Rack
1984	58	46	12	215	172	43
1985	29	23	6	108	86	22
1986	28	22	6	108	86	22
Total	115			431		

1/ 3%
2/ 80% commerical harvest

Chinook production from 1981 release is given in Appendix E.

APPENDIX G

Experimental Tagging - Deer Mountain Hatchery
Coho Salmon

Appendix G - Experimental Tagging

DEER MOUNTAIN HATCHERY

3. Inside-vs-Outside Rearing-Coho Salmon.

A. Tag Code 4-19-16, 6,480 valid tags, inside
B. Tag Code 4-20-41, 12,672 valid tags, outside

Comparison - Two groups of coho salmon were tagged which were similar in origin, size, etc. but one was reared inside the hatchery, the other in outdoor ponds of similar nature. The hypothesis to be tested is that there is no difference in the numbers of adults returning.

Expected adult coho salmon produced by Deer Mountain 1981 release - outside-vs.-inside rearing[1/]

Year	Age	Total	Fishery[2/]	Rack
1982	1.1	2026	1216	810

1/ 3% Marine Survival
2/ 60% Commercial Catch

Expected numbers of tagged coho salmon from Deer Mountain 1981 release-outside-vs.-inside rearing[1/]

Code	4-19-16 (6,480)			4-20-41 (12,672)		
Year	Total	Fishery[2/]	Rack	Total	Fishery	Rack
1982	194	58	78	380	114	152

1/ 3% Marine Survival
2/ 60% Commercial Catch
50% Sampling

APPENDIX H

Experimental Tagging - Auke Creek Hatchery
Chum Salmon

Appendix H - Experimental Tagging

AUKE CREEK DIET TRIAL

Diet trial - chum salmon

A. Tag Code 4-7-7, 839 valid tags, Abernathy Dry Diet.
B. Tag Code 4-7-6, 860 valid tags, Alaska Moist Pellet-H
C. Tag Code 4-7-5, 880 valid tags, Alaska Moist Pellet-M.
D. Tag Code 4-7-4, 875 valid tags, Alaska Moist Pellet-L.
E. Tag Code 4B-8-5, 863 valid tags, BioDiet
F. Tag Code 4B-8-6, 822 valid tags, Oregon Moist Pellet
G. Tag Code 4B-8-7, 839 valid tags, Alaska Dry Pellet.

Comparison - Seven small groups of tagged chum salmon were released in 1981 terminating a hatchery diet study. All released fish were tagged so that comparisons among returns of various groups can be made. As release numbers were small, return data will be statistically weak.

Expected adult chum salmon produced from 1981 diet study-Auke Bay[1/]

Year	%	Age	Annual/Rack
1983	20	0.2	36
1984	75	0.3	135
1985	5	0.4	9

1/ 3% Marine Survival
No interception

Expected number of tagged fish chum salmon from 1981 diet study-Auke Bay[1/]

	(839) 4-7-7	(860) 4-7-6	(880) 4-7-5	(875) 4-7-4	(863) 4B-8-5	(822) 4B-8-6	(839) 4B-8-7
1983	5	5	5	5	5	5	5
1984	19	19	20	20	19	19	19
1985	1	2	1	1	2	1	1
Total	25	26	26	26	26	25	25

1/ 3% Marine Survival
No Interception

APPENDIX I

Experimental Tagging - Speel Lake Wildstock Coho Salmon

Appendix I - Experimental Tagging

SPEEL LAKE COHO SALMON WILDSTOCK TAGGING

1. Speel Lake - coho salmon

   A. Tag Code 4-21-45, 7,910 valid tags, small group
   B. Tag Code 4-21-72, 4,210 valid tags, large group

Comparison - Two groups of coho salmon wildstock were captured, tagged, and released into Speel Lake in September 1981. The groups contained distinctly different sized fish. The group containing the largest fish was thought to consist of fish that had already spent one winter in the lake and would emigrate the following spring as "two check" smolts. The other group, consisting of uniformly smaller fish, was thought to be comprised of fish about to spend their first winter in the lake. Unfortunately, no scales were taken to confirm ages in the two groups. Since one-third of all the fish tagged were of the larger size group, this could have implications on use of this stock in a hatchery if these fish were overwintering a second time in the lake. The differential tagging may provide indications as to the numbers of fish of this stock that emigrate after 1 year of freshwater rearing.

No information on total lake production available.

Number of tagged coho salmon from 1981 Speel Lake tagging[1/].

	4-21-45 (7,910)			4-21-72 (4,210)		
	Total	Fishery	Weir	Total	Fishery	Weir
1983	237	59	119	126	32	63

1/ 3% Marine Survival
50% Commercial Catch
50% Sampling

APPENDIX J

Summary of 1981 Tag Groups

APPENDIX J
Summary of 1981 Tag Groups

	Code	Species	Hatchery	Release date	Return date	Release No.	Expected Return No.	Release size(g)	Origin
1.	4-4-6	Chum	Hidden Falls	15 April 1981	1983-85	29,947	83 - 30 84 - 479 85 - 90 total 599	1.61	Kadashan
2.	4-4-5	Chum	Hidden Falls	15 May 1981	1983-85	30,156	83 - 30 84 - 483 85 - 90 total 603	2.43	Kadashan
3.	4-20-49	King	Snettisham	29 May 1981	1984-86	23,569	84 - 226[1/] 85 - 226 86 - 19 total 471	12.0	King Sal. Riv.
4.	4-4-4	Chum	Snettisham	8 May 1981	1983-85	45,602	83 - 68[2/] 84 - 1,095 85 - 205 total 1,368	1.09	Neka
5.	4-19-7	Coho	Snettisham	29 May 1981	1982	2,356	82 - 24[3/]	5.5	Speel Lake
6.	4-19-18	Coho	Snettisham	29 May 1981	1982	7,795	82 - 78	5.5	Speel Lake
7.	4-19-19	Coho	Snettisham	29 May 1981	1982	7,990	82 - 80	5.5	Speel Lake

APPENDIX J (continued)
Summary of 1981 Tag Groups

	Code	Species	Hatchery	Release date	Return date	Release No.	Expected Return No.	Release size(g)	Origin
8.	4-20-43	King	Crystal Lake	15 May 1981	1983-85	18,682	83 - 274[4/] 84 - 139 85 - 25 total 448	38	Andrew Cr.
9.	4-20-42	King	Crystal Lake	15 May 1981	1983-85	18,530	83 - 280[4/] 84 - 138 85 - 27 total 445	38	Andrew Cr.
10.	4-20-45	King	Crystal Lake	15 May 1981	1983-85	1,905	83 - 29[4] 84 - 14 85 - 3 total 46	38	Andrew Cr.
11.	4-20-44	Coho	Crystal Lake	1 June 1981	1982	20,355	82 - 407[5/]	16.3	Crystal Cr.
12.	4-19-22	Coho	Crystal Lake	26/27 June 1981	1982	9,902	82 - 198	15.6	Crystal Cr.
13.	4-20-51	Coho	Crystal Lake	26/27 June 1981	1982	25,722	82 - 514	15.6	Crystal Cr.
14.	4-20-52	Coho	Crystal Lake	26/27 June 1981	1982	25,119	82 - 502	15.6	Crystal Cr.
15.	4-4-3	Chum	Crystal Lake	1 May 1981	1983-85	11,575	83 - 3[6/] 84 - 102 85 - 11 total 116	1.4	Crystal Cr.
16.	4-3-6	Chum	Klawock	April/May 1981	1983-85	8,508	83 - 17[7/] 84 - 64 85 - 4 total 85	1.2-2.1	Klawock River

APPENDIX J (continued)
Summary of 1981 Tag Groups

	Code	Species	Hatchery	Release date	Return date	Release No.	Expected Return No.	Release size(g)	Origin
17.	4-5-1	Chum	Klawock	Apr./May 1981	1983-85	6,676	83 - 13[7/] 84 - 64 85 - 4 total 85	1.2-4.1	Klawock River
18.	4-3-5	Chum	Klawock	Apr./May 1981	1983-85	15,438	83 - 30[7/] 84 - 116 85 - 8 total 154	1.0-4.1	Klawock River
19.	4-19-13	Chum	Klawock	26 May 1981	1983-85	9,122	83 - 18[7/] 84 - 68 85 - 5 total 91	6.5	Klawock River
20.	4-19-23	Chum	Klawock	26 May 1981	1983-85	8,944	83 - 18[7/] 84 - 67 85 - 4 total 89	6.6	Klawock River
21.	4-19-24	Chum	Klawock	26 May 1981	1983-85	1,596	83 - 3 84 - 12 85 - 1 total 16	6.5	Klawock River
22.	4-19-41	Coho	Klawock	26/27 March 1981	1982	17,069	82 - 683	19	Klawock River
23.	4-19-42	Coho	Klawock	28 May 1981	1982	18,494	82 - 740	25	Klawock River

APPENDIX J (continued)
Summary of 1981 Tag Groups

Code	Species	Hatchery	Release date	Return date	Release No.	Expected Return No.	Release size(g)	Origin
24. 4-20-53	Coho	Klawock	10 Apr. 1982[8] /	1983	38,153	83 - 763	25	Klawock River
25. 4-21-59	Coho	Klawock	26 May 1982[8/]	1983	21,950	83 - 439	27	Klawock River
26. 4-19-12	Steelhead	Klawock	17 June 1981	1984	6,422	84 - 600[10/]	42.4	Klawock River
27. 4-19-17	King	Deer Mtn.	15 May 1981	1984-86	3,821	84 - 58 85 - 29 86 - 28 total 115	29.6	Cripple Creek
28. 4-19-43	King	Deer Mtn.	15 May 1981	1984-86	14,364	84 - 215 85 - 108 86 - 108 total 431	29.6	Cripple Creek
29. 4-19-45	King	Deer Mtn.	15 May 1981	1983-85	14,533	84 - 218 85 - 109 86 - 109 total 436	18	Cripple Creek
30. 4-20-39	King	Deer Mtn.	15 May 1981	1983-85	15,204	84 - 228 85 - 114 86 - 114 total 456	16.8	Cripple Creek
31. 4-20-40	King	Deer Mtn.	15 May 1981	1983-85	15,734	84 - 236 85 - 118 86 - 118 total 472	13.4	Cripple Creek

APPENDIX J (continued)
Summary of 1981 Tag Groups

Code	Species	Hatchery	Release date	Return date	Release No.	Expected Return No.	Release size(g)	Origin
32. 4-19-44	King	Deer Mtn.	1982	1984-86	19,886	85 - 299[9/] 86 - 149 87 - 149 total 597		Cripple Creek
33. 4-19-16	Coho	Deer Mtn.	1 June 1981	1982	6,480	82 - 194	17.8	Ketchikan Creek
34. 4-20-41	Coho	Deer Mtn.	1 June 1981	1982	12,672	82 - 380	15.9	Ketchikan Creek
35. 4-19-15	Steelhead	Deer Mtn.	8 June 1981	1984	2,174	84 - 217[10/]	120	Ketchikan Creek
36. 4-19-14	Steelhead	Deer Mtn.	1 June 1981	1984	1,112	84 - 111	65.4	Ketchikan Creek
37. 4-7-7	Chum	Auke Creek	15 May 1981	1983-85	839	83 - 5 84 - 19 85 - 1 total 25	0.91	Auke Creek
38. 4-7-6	Chum	Auke Creek	15 May 1981	1983-85	860	83 - 5 84 - 19 85 - 2 total 26	1.23	Auke Creek
39. 4-7-5	Chum	Auke Creek	15 May 1981	1983-85	880	83 - 5 84 - 20 85 - 1 total 26	1.20	Auke Creek
40. 4-7-4	Chum	Auke Creek	15 May 1981	1983-85	875	83 - 5 84 - 20 85 - 1 total 26	1.21	Auke Creek

APPENDIX J (continued)
Summary of 1981 Tag Groups

	Code	Species	Hatchery	Release date	Return date	Release No.	Expected Return No.	Release size(g)	Origin
41.	4B-8-5	Chum	Auke Creek	15 May 1981	1983-85	863	83 - 5 84 - 19 85 - 2 total 26	1.27	Auke Creek
42.	4B-806	Chum	Auke Creek	15 May 1981	1983-85	822	83 - 5 84 - 19 85 - 1 total 25	1.28	Auke Creek
43.	4B-8-7	Chum	Auke Creek	15 May 1981	1983-85	839	83 - 5 84 - 19 85 - 1 total 25	1.36	Auke Creek
44.	4-21-45	Coho	Speel Lake	8-10 Sept. 1981	1982	7,910	82 - 237	78.6mm.	Speel Lake
45.	4-21-72	Coho	Speel Lake	8-10 Sept. 1981	1983	4,210	82 - 126	104.6mm.	Speel Lake
46.	4-20-46	Sockeye	Hugh Smith Lk.	13-19 May 1981	1983-85	10,528	83 - 211 84 - 737 85 - 105 total 1,053	3.55	Hugh Smith Lake
47.	4-19-25	Sockeye	Hugh Smith Lk.	27 May-10 June 1981	1983-85	7,621	83 - 153 84 - 533 85 - 76 total 762	3.55	Hugh Smith Lake
48.	4-20-47	Sockeye	Hugh Smith Lk.	19-27 May 1981	1983-85	10,225	83 - 205 84 - 716 85 - 102 total 1,023	3.55	Hugh Smith Lake

APPENDIX J (continued)
Summary of 1981 Tag Groups

1. King salmon return based on 2% marine survival and 48, 48 & 4% year class strengths.
2. Chum salmon return based on 3% marine survival and 5, 80, & 15% year class strengths.
3. Coho salmon return based on 1% marine survival.
4. King salmon return based on 2.4% marine survival and 63, 31, & 6% year class strengths.
5. Coho salmon return based on 2% marine survival.
6. Chum salmon return based on 1% marine survival and 3, 88, 8% year class strength.
7. Chum salmon return based on 1% marine survival and 20, 75, 5% year class strength.
8. Coho salmon released in 1982 - return based on 2% marine survival.
9. King salmon return based on 3% marine survival and 50, 25 & 25% year class strengths.
10. Steehead trout return based on 10% marine survival; multiple spawning precludes year class analysis.
11. Sockeye salmon return based on 10% marine survival; 20, 70 & 10 year class strength. Age at emigration assumed 1.0.